

Aura Validation
Large Balloons: Recent Campaigns
and
Table Mountain NO₂ Intercomparison

Jim Margitan/JPL

October 1, 2007

Aura Validation: Large Balloons

Recent Campaigns

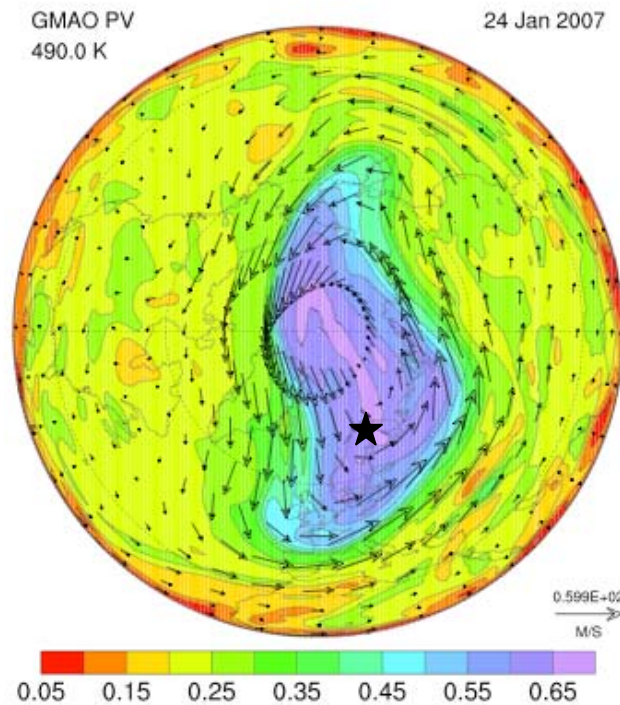
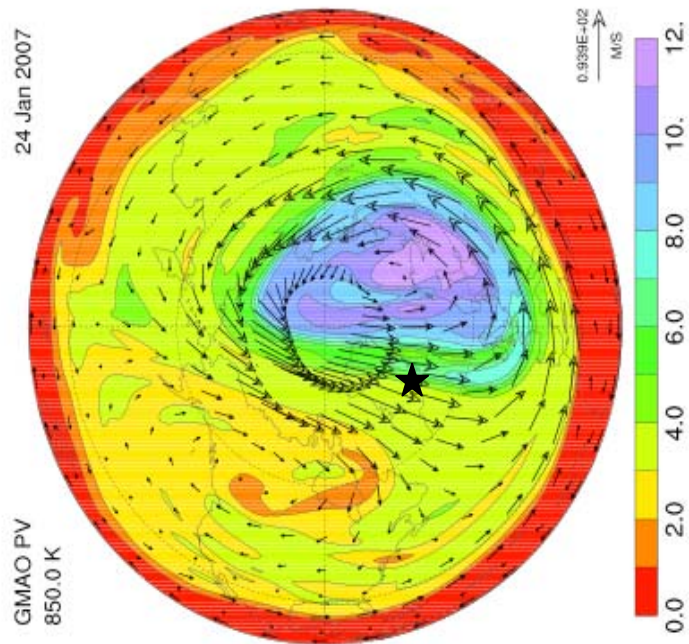
- Kiruna, Sweden, Jan-Feb 2007
 - FIRS2/SLS/Ozone 20070124
 - MkIV (ascent data) 20070222
 - Balloon burst at float 20070206 and 20070222
 - Flights deep in very cold, perturbed vortex
- Ft. Sumner, NM Sep 2007
 - MkIV/SLS/FIRS2/BOH/Ozone 20070922
 - 31 hour flight

SLS/FIRS2/Ozone Polar Vortex Balloon Flight for Aura Validation: Kiruna, Sweden January, 2007

- ❑ Successful flight of the emission remote-sensor payload into the cold chemically perturbed winter polar vortex for validation of the instruments on Aura, especially MLS: Flight Jan 24, 2007 to 110,000 ft.
- ❑ Instruments: JPL's Submillimeterwave Limb Sounder and in situ Ozone and SAO's Far Infrared Spectrometer
- ❑ Measurements: Vertical profiles of O_3 , ClO , HCl , HNO_3 , $HOCl$, OH , HO_2 and other gases involved in ozone depletion chemistry
- ❑ Instrument performance was excellent and payload recovered undamaged

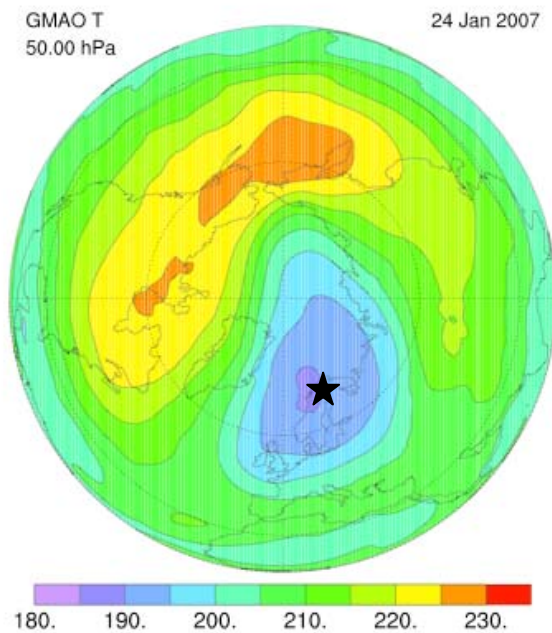


PV for SLS/FIRS2 Kiruna Flight Jan 24, 2007



Plots from Manney/MLS

Temperature for SLS/FIRS2 Kiruna Flight Jan 24, 2007



SLS/FIRS2/Ozone Polar Vortex Balloon Flight for Aura Validation: Kiruna, Sweden January, 2007

❑ SLS Highlights (Bob Stachnik, PI):

- ❑ deep cold vortex flight with temperature minimum of ~187 K at ~25 hPa.
- ❑ elevated ClO (1.4 ppb peak at 30 hPa) and
- ❑ reduced HCl in the lower strat.

❑ FIRS2 Highlights (Ken Jucks/SAO, PI):

- ❑ OH and HO₂ were retrieved down to below 20 km.
- ❑ HOCl was retrieved down to 17 km, large amount relative to mid latitude.
- ❑ HNO₃ shows significant redistribution of NO_y given the oscillatory behavior of the profile.
- ❑ H₂O vapor does not appear to be dehydrated. The temps were close to ice transition point.
- ❑ HCl is definitely low and converted, but not zero in the cold part of the stratosphere. FIRS-2 was roughly 1 sigma lower than that of MLS.

❑ Ozone Highlights (Jim Margitan, PI):

- ❑ Excellent agreement ascent and descent profiles
- ❑ Ozone 4.4 ppm at peak (14 mb)
- ❑ Min T 187K at 50 mb (ascent), 187K at 22 and 50 mb (descent).

❑ Data in archive

❑ Science talk Tuesday, 5 PM: Bob Stachnik: Polar winter balloon-borne observations for Aura Validation

MkIV Balloon Flights – Esrange 2007

Voltaire Velazco, Jean-Francois Blavier, Geoff Toon, (JPL)

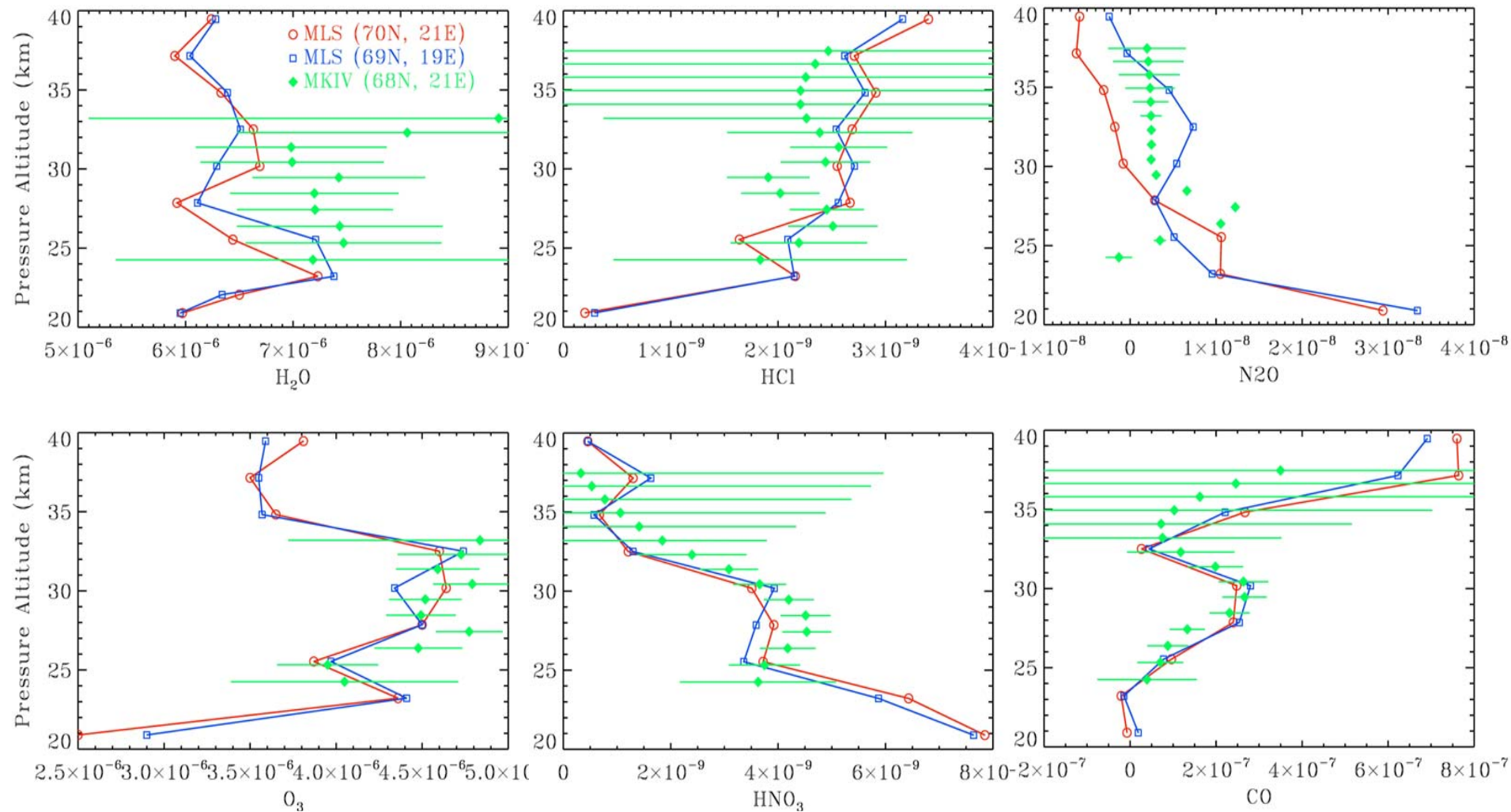
The JPL MkIV was launched deep into the vortex on Feb 6 and Feb 22. On both occasions the balloon burst (got too cold) upon reaching float. No occultation data were obtained on either flight.

A few spectra were obtained during the Feb 22 ascent (daytime launch). These have a lower sensitivity to trace gases than occultation spectra, but still allow the retrieval of strongly-absorbing gases over 25-34 km.



MkIV – MLS profile Comparisons

Six gases compared so far: H_2O , O_3 , HCl , HNO_3 , N_2O , CO .
MLS profiles are blue/red. MkIV are green.



JPL Remote Payload (MkIV/SLS/FIRS2/BOH/Ozone)

Ft. Sumner, NM Sep 22-23, 2007

Combined payload includes:

Submillimeter Limb Sounder

PI - Robert Stachnik

Mark IV solar interferometer

PI – Geoffrey Toon

Balloon OH limb sounder

PI – Herbert Pickett

Far-Infrared Spectrometer

PI – Kenneth Jucks (SAO)

In-situ Ozone Photometer

PI – James Margitan

Balloon Team

Jess Landeros

Jean-Francois Blavier

Voltaire Velasquez

Tim Crawford

Carolyn Brauer

Brian Drouin (photo)



Launched at 9:30 am by the Columbia Scientific Balloon Facility, the payload reached float near solar noon and stayed aloft 31 hours though 3 satellite (A-train) overpasses and two sun-transits.

Remote emission measurements focused on OH, HO₂, BrO, ClO and HCl.

Solar occultations provide measurements of many trace species deep into the troposphere.

The ozone photometer provided in-situ ozone profiles during ascent and descent and measurements at float.

Aura Validation: Large Balloons Campaign Summary

- Ft. Sumner, NM
 - Sep 2004
 - OMS in situ 20040917
 - MkIV/SLS/FIRS2/BOH 20040923
 - CWAS 20040929
 - Sep 2005
 - MkIV/SLS/FIRS2/BOH/Ozone 20070920
 - CWAS/Ozone 20050101
 - Sep 2007
 - MkIV/SLS/FIRS2/BOH/Ozone 20070922
- Kiruna, Sweden, Jan-Feb 2007
 - FIRS2/SLS/Ozone 20070124
 - MkIV (ascent data) 20070222

NO₂ Intercomparison at Table Mountain Facility

July 1-13, 2007 (Stan Sander/JPL)

Objective: To improve the understanding of ground-based spectroscopic methods used for validation of OMI NO₂ and O₃ data products.

Participants

Group	Institution	Instrument(s)	Mode
Mount , Gibson, Spinei	WSU	MF-DOAS	Multi-Angle + Direct Solar
Herman , Abuhassan, Bojkov, Cede, McPeters	GSFC	Brewer Pandora (3)	Direct Solar
Sander , Pongetti	JPL	FTUVS	Direct Solar

Poster Presentations at this Meeting

- # 43: A. Cede et al., "Total NO₂ columns from ground-based direct-sun measurements
- # 45: E. Spinei et al. "Comparison of tropospheric/total NO₂ columns ..."
- # 46: T. Pongetti et al. "Retrieval of NO₂ absolute columns in the strat. and trop. ..."